Presentation to Newton Aldermen

Newton City Hall

June 10, 2003

by

Richard Temkin
35 O'Rourke Path, Newton

Oak Hill Park Resident, 25 Years

Credentials

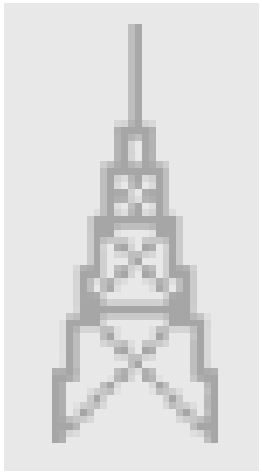
- Ph. D., Physics, MIT

- Senior Scientist, MIT Department of Physics
- Associate Director, MIT Plasma Science and Fusion Center

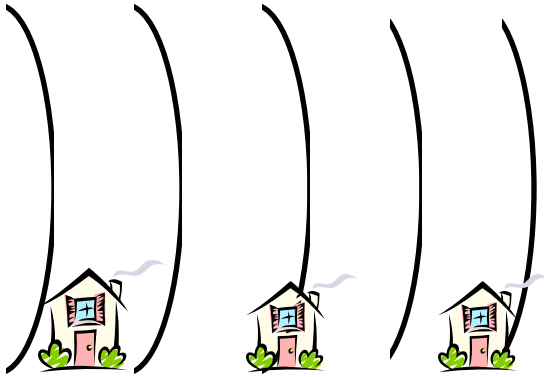
- Fellow, Institute of Electrical and Electronics Engineers (IEEE)
- Fellow, American Physical Society

- Over 200 published papers
- Research on microwave sources, antennas, microwave techniques and applications.

AM Radio Broadcasts vs. FM, TV, Cell Broadcasts



AM Tower

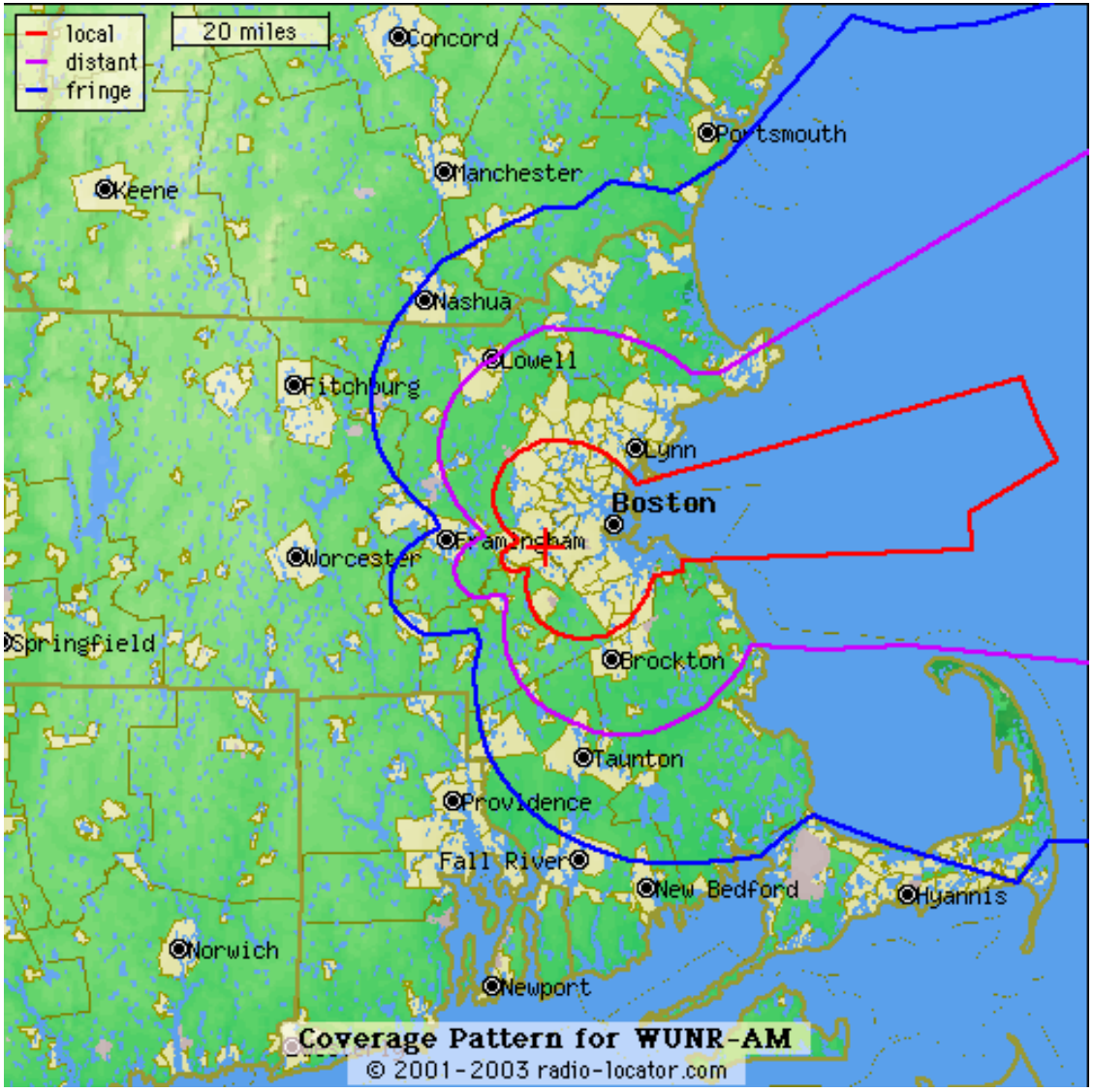


AM broadcasts through the neighborhood

FM, TV, Cell Towers

FM, TV and Cell Towers broadcast over the neighborhood.

WUNR, 1600 kHz Radiation Pattern
5 kW, 2 Towers

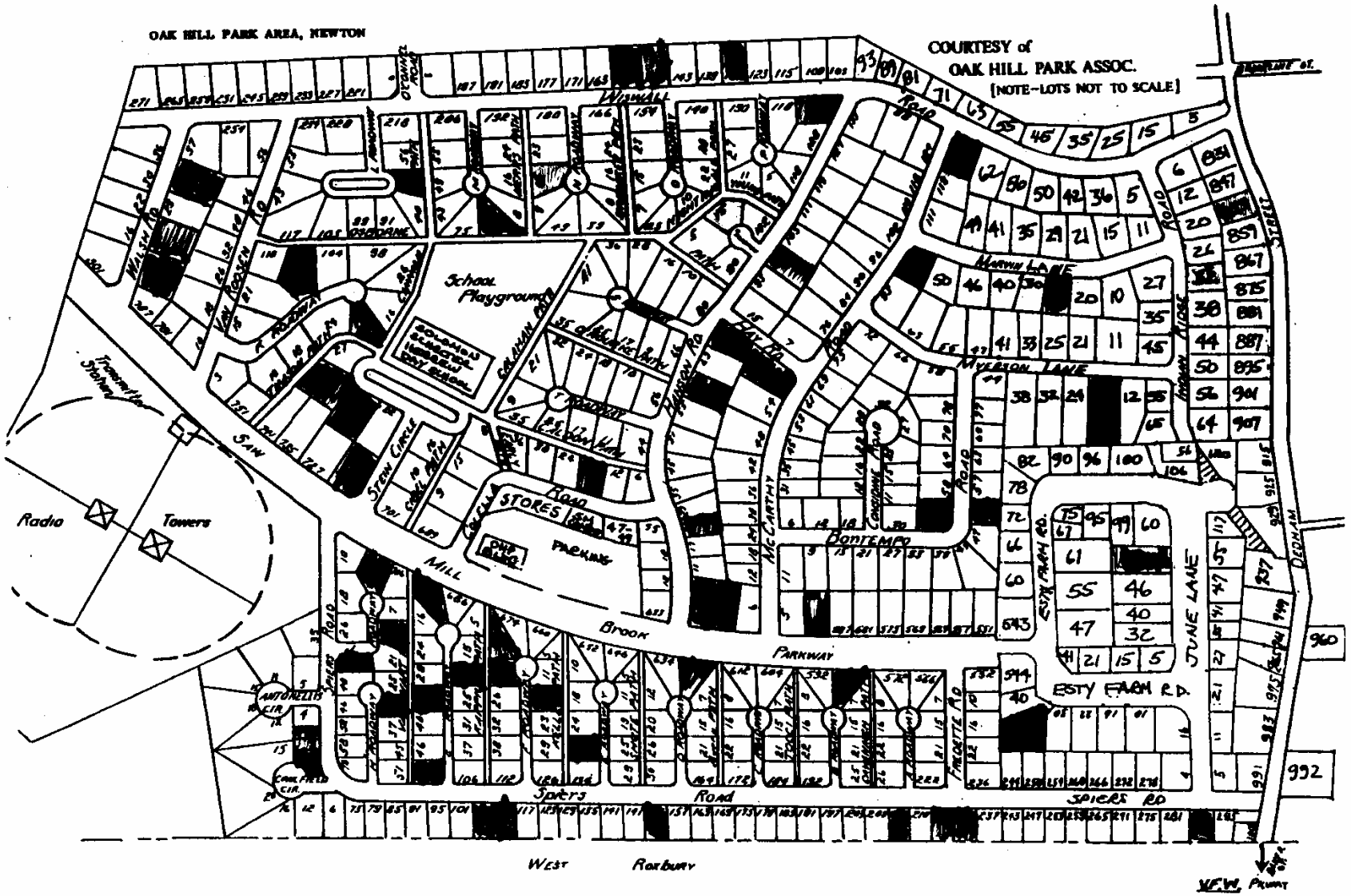


- **Local Coverage:** Within this area, you should be able to receive the radio station on almost any radio with moderately good to very good reception.
- **Distant Coverage:** Within this area, the signal of the radio station may be weak unless you have a good car radio or a good stereo with a good antenna. You may not be able to receive the station at all on walkmans or other portable radios.
- **Fringe Coverage:** Within this area, the station's signal will be very weak. You may be able to receive this station if you have a very good radio with a good antenna, but it's possible that interference from other stations may prevent you from picking up these stations at all.

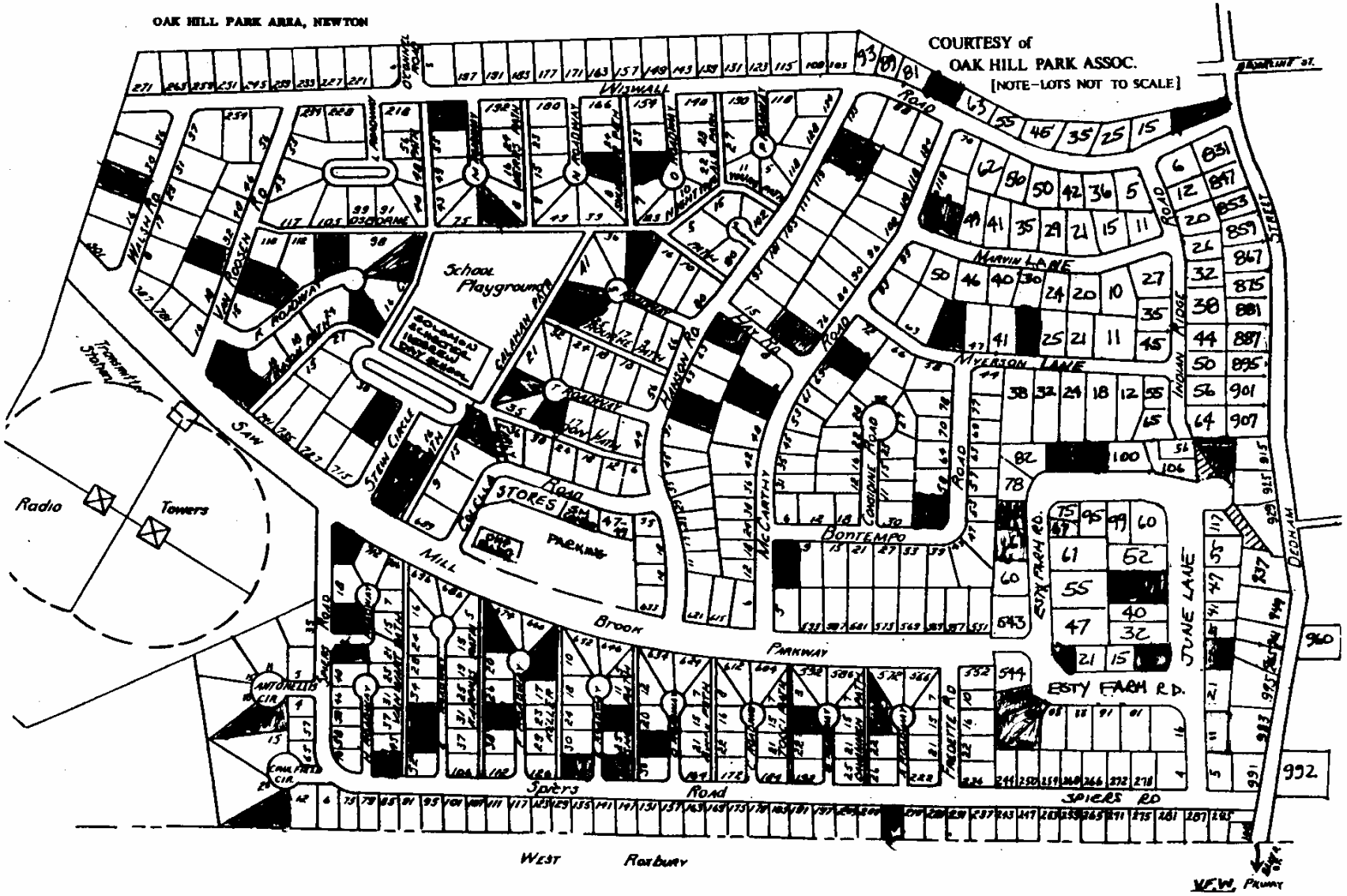
Aerial Photo Showing Oak Hill Park and WUNR

WUNR Broadcasts Through OHP

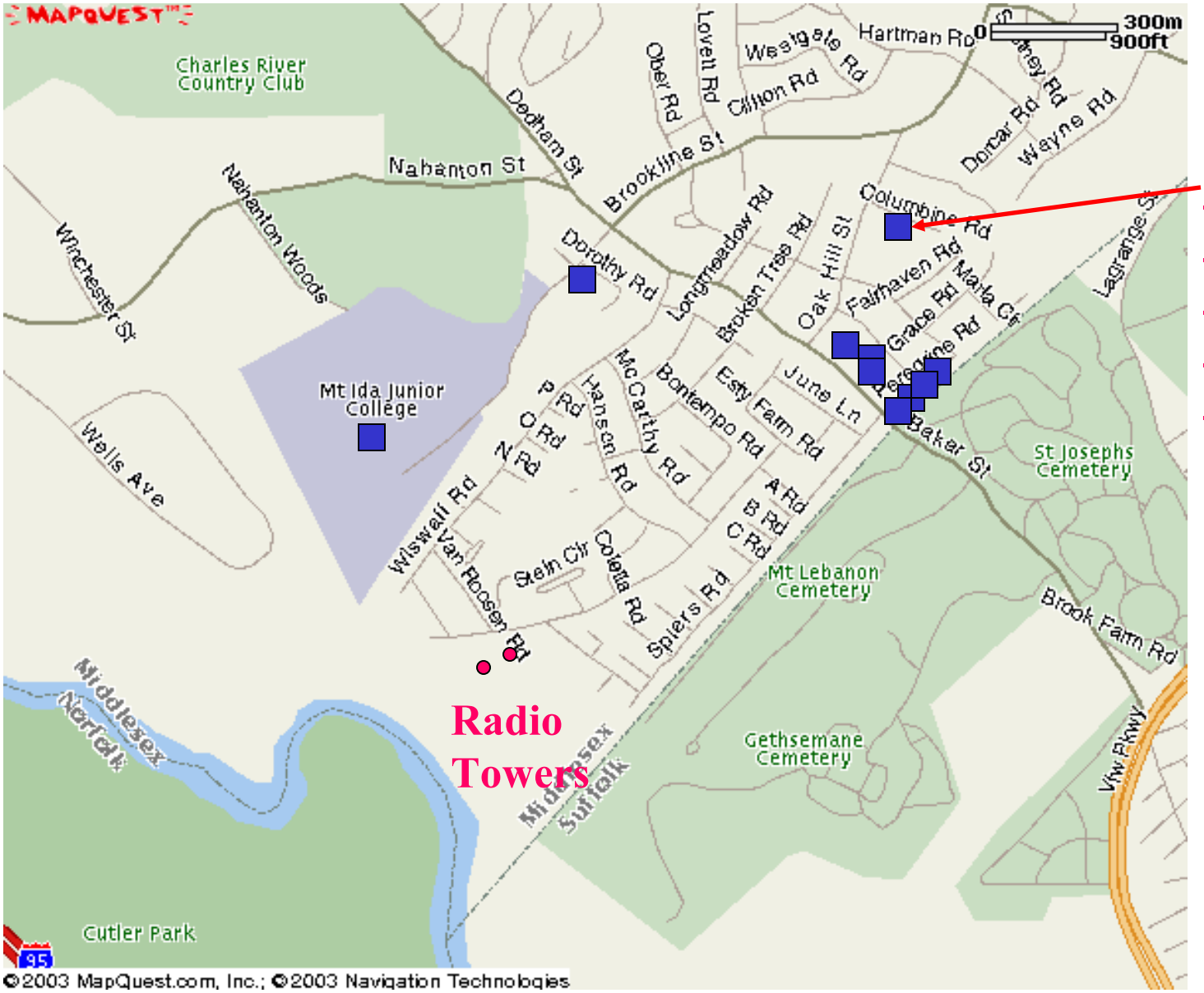
62 HOMES SERVICED BY HI-TECH REPS 11/00



MORE THAN 80 HOMES WITH INTERFERENCE. OHPA LIST (2003)
(MS. MAXINE MARCUS)



Oak Hill Park; Reports of Distant Interference shown as ■



Radiation Pattern Calculations

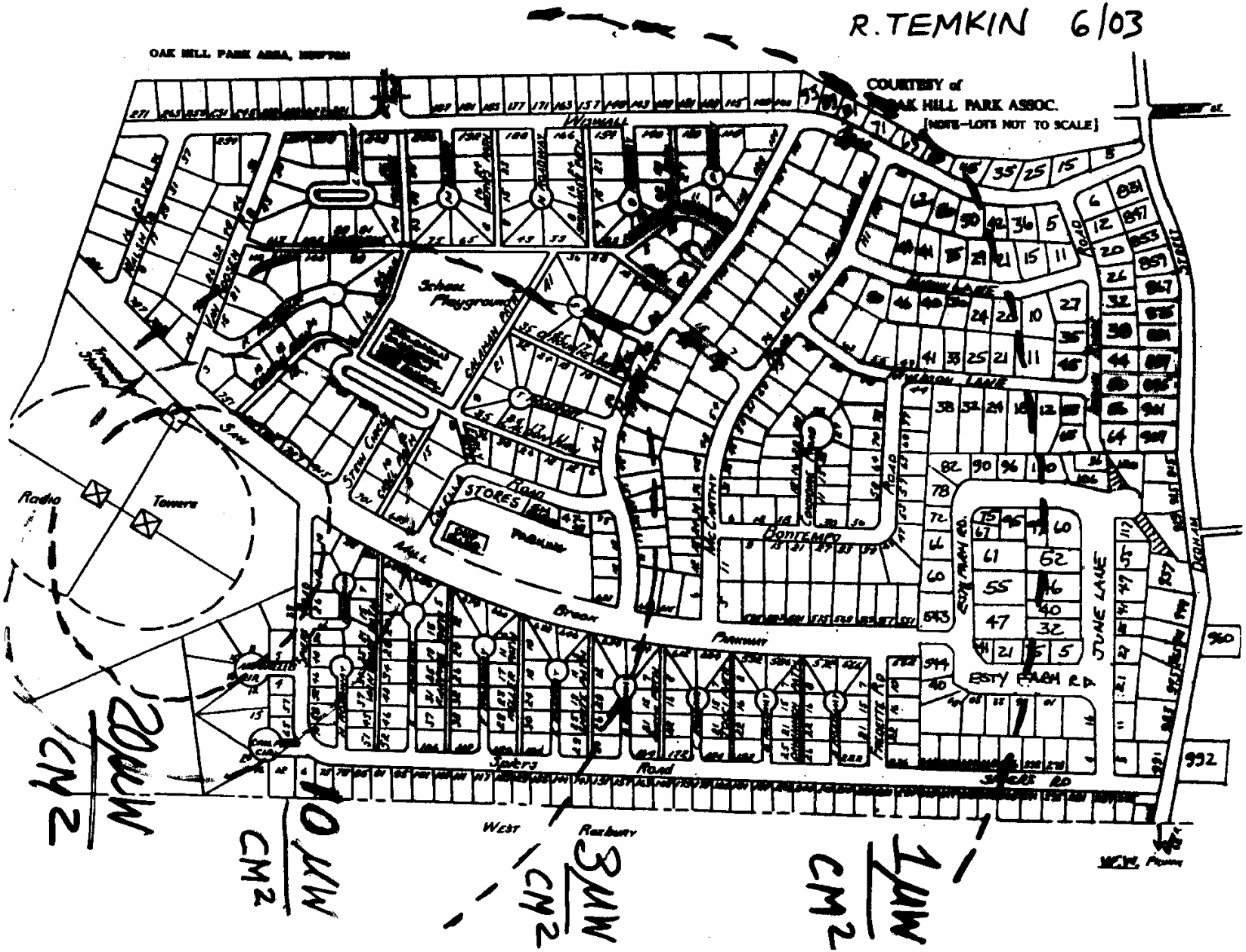
• Calculation of radiation pattern of existing radio station, **5 kW, 2 Towers,** WUNR

• Assumptions:

•Far field radiation pattern.
  • Assume equal power in E and H fields.
  • Results most valid far from the tower.
• The radiation pattern of the two towers is optimized to radiate in a single direction.
  • In this case, the direction is towards Boston.
• Results (contours) for radiation intensities of 20 $\mu W/cm^2$; 10 $\mu W/cm^2$; 3 $\mu W/cm^2$; and 1 $\mu W/cm^2$.

CALCULATED RADIATION PATTERN, 5 kW

R. TEMKIN 6/03



Radiation Pattern Measurements

- First measurements made in April, 2002.
  - NARDA Model 8761 probe with NARDA Model 8716 Electromagnetic Monitor.
  - Equipment is calibrated with accuracy traceable to US Government standards laboratories (NIST).

- Additional measurements made in 2003 with an AlphaLab portable RF Field Strength meter.

- Additional, independent measurements by Dr. Robert Sklar.

- **Result and conclusion: Measured Patterns are in good agreement with the calculations.**

Conclusions from Radiation Survey (1)

Intensity:	Result:	Homes (Approx.) :
10 μW/cm² or above	Severe Interference Radiators Speak! Repair possible?	45
1 to 10 μW/cm²	Major Interference TV, Telephone, Stereo Professional help needed for repairs. Repair not certain!!	400
0.5 to 1 μW/cm²	Significant Interference Professional help may be needed.	200 + Mt. Ida

Conclusions from Radiation Survey (2)

- **Radiation Pattern understood.**
- **Theory agrees with experimental measurements.**
- **Procedure may be used for predicting the effects of proposed antenna array: 3 radio stations broadcasting from 5 towers.**

New Radiation Pattern, 3 Stations (1)

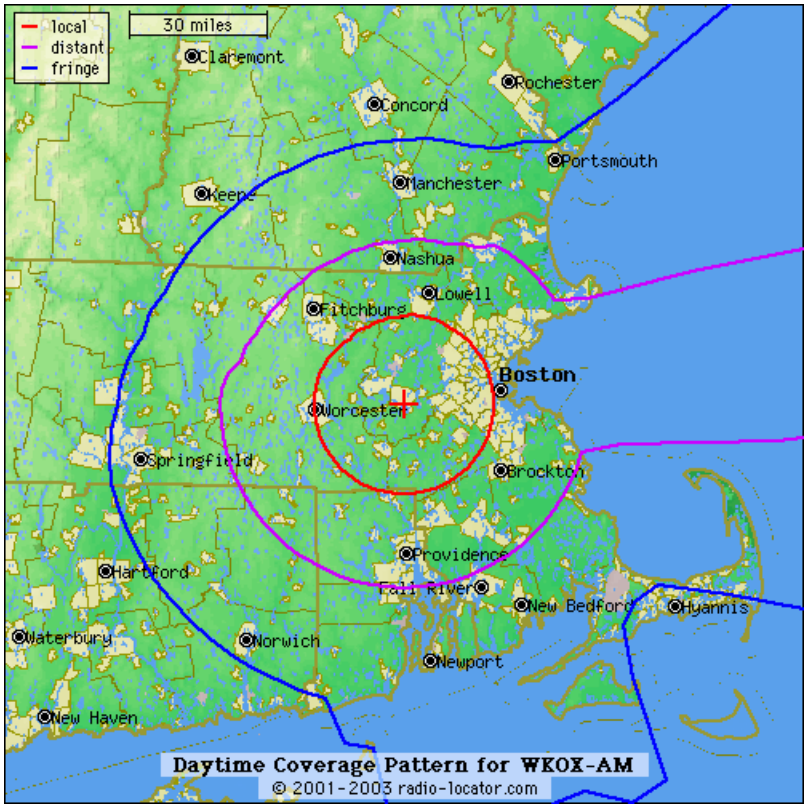
- **Summary of 3 Stations:**

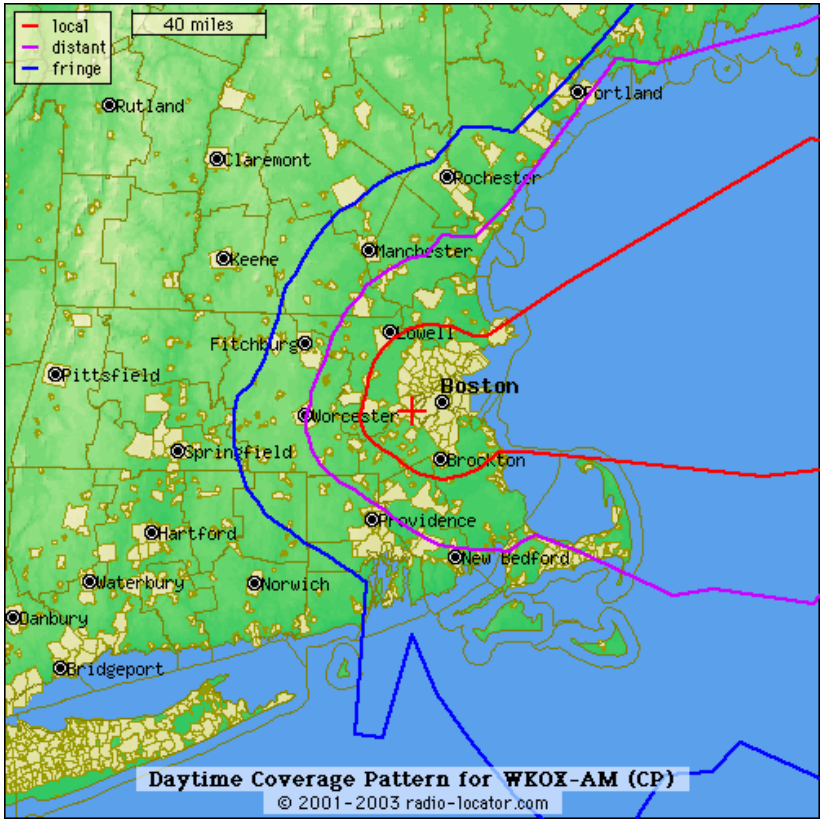
Station	Power Level Requested	FCC Allowed Power Level
WKOX	50 kW	50 kW
WRCA	25 kW	50 kW
WUNR	20 kW	50 kW
Total	95 kW	150 kW

Predicted New Radiation Pattern, 3 Stations (2)

- Power Increase: Factor of 30
  - 150 kW vs. 5 kW
- Towers move much closer to neighborhood
  - 150 ft. vs. 430 ft.
- Towers are shorter (199 ft vs. 350 ft.)
  - Increased field intensity at homes.
- Five Towers vs. two Towers
  - The power can be beamed in a narrower cone by a factor of about 5/2.
- Summary: radiation intensity can increase by over 100 times.
  - Factor of 30 used in calculations (conservative.)

WKOX-AM, Framingham, 1200 kHz

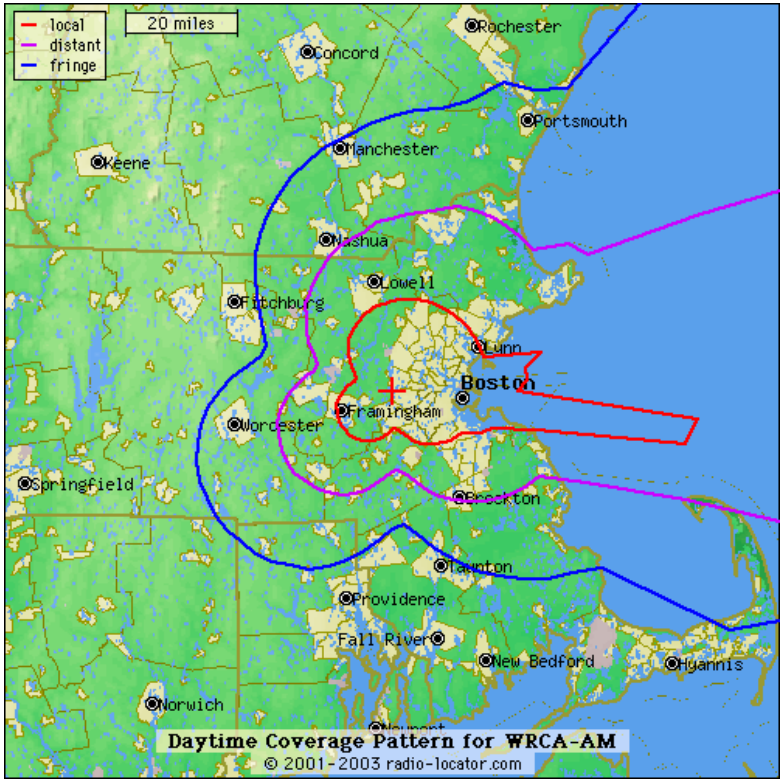


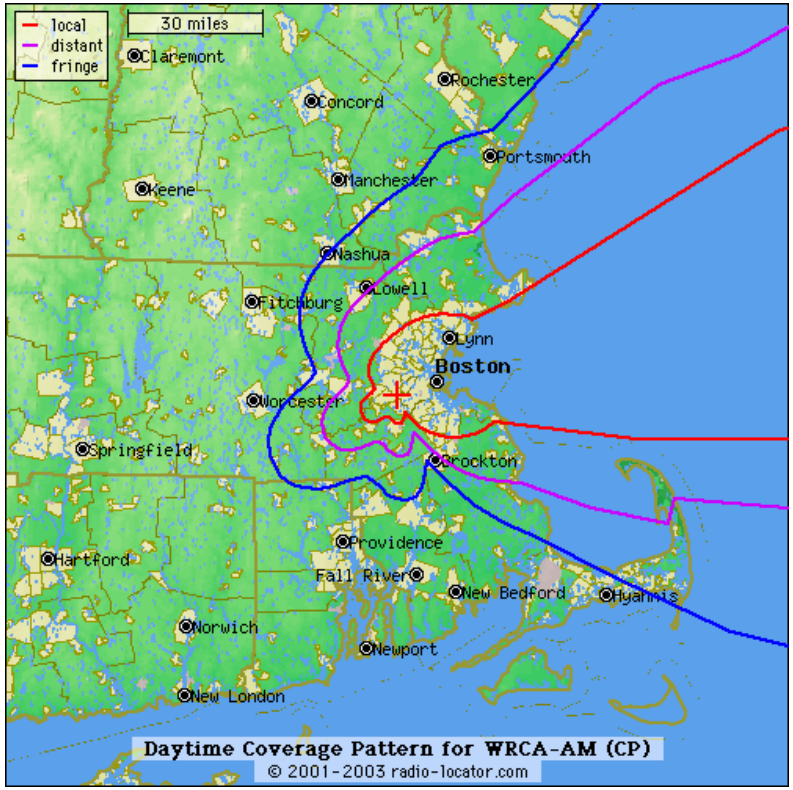


Present Day, Framingham: Daytime, 10,000 W

Permit for Newton Site: Daytime, 50,000 W

WRCA-AM 1330 kHz, Waltham

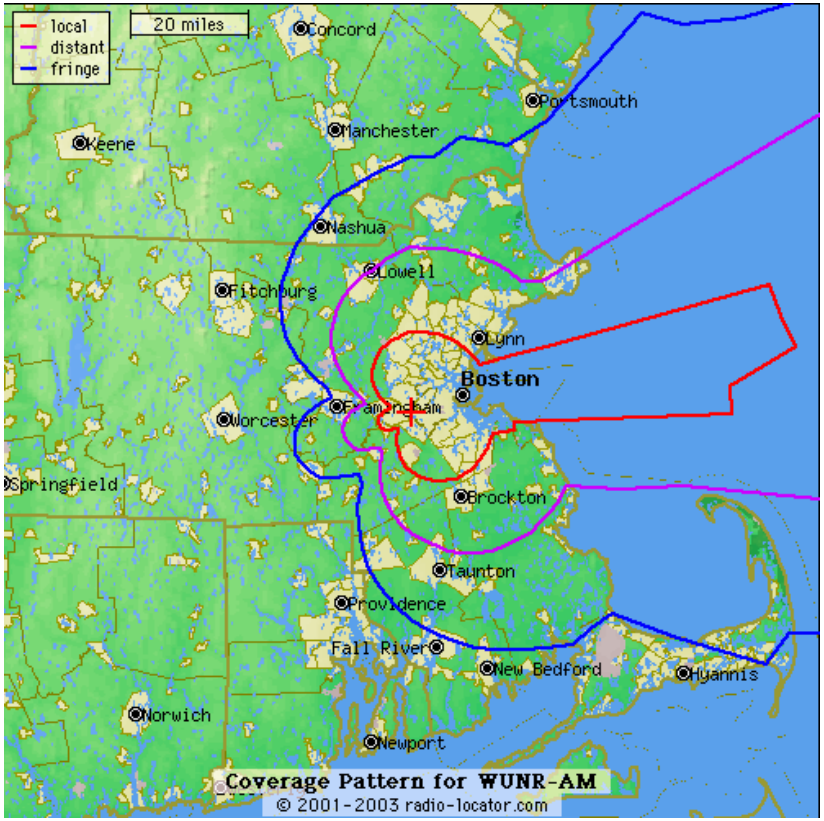




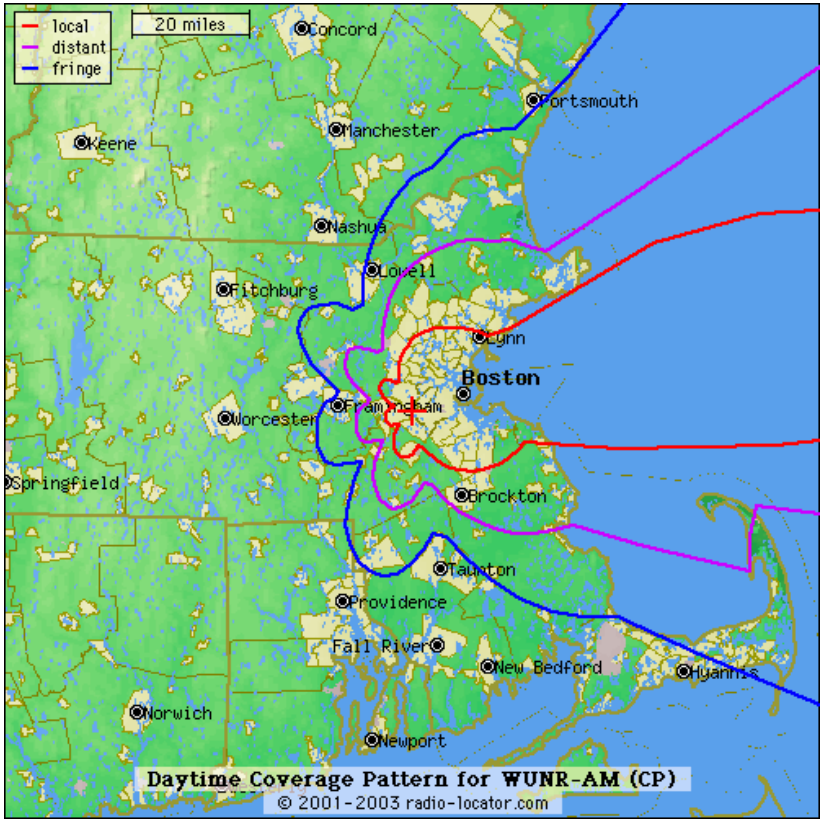
Present Coverage
5 kW, 2 Towers

Permit for Newton Site
25 kW, 5 Towers

WUNR Proposed New Pattern, 20 kW, 5 Towers

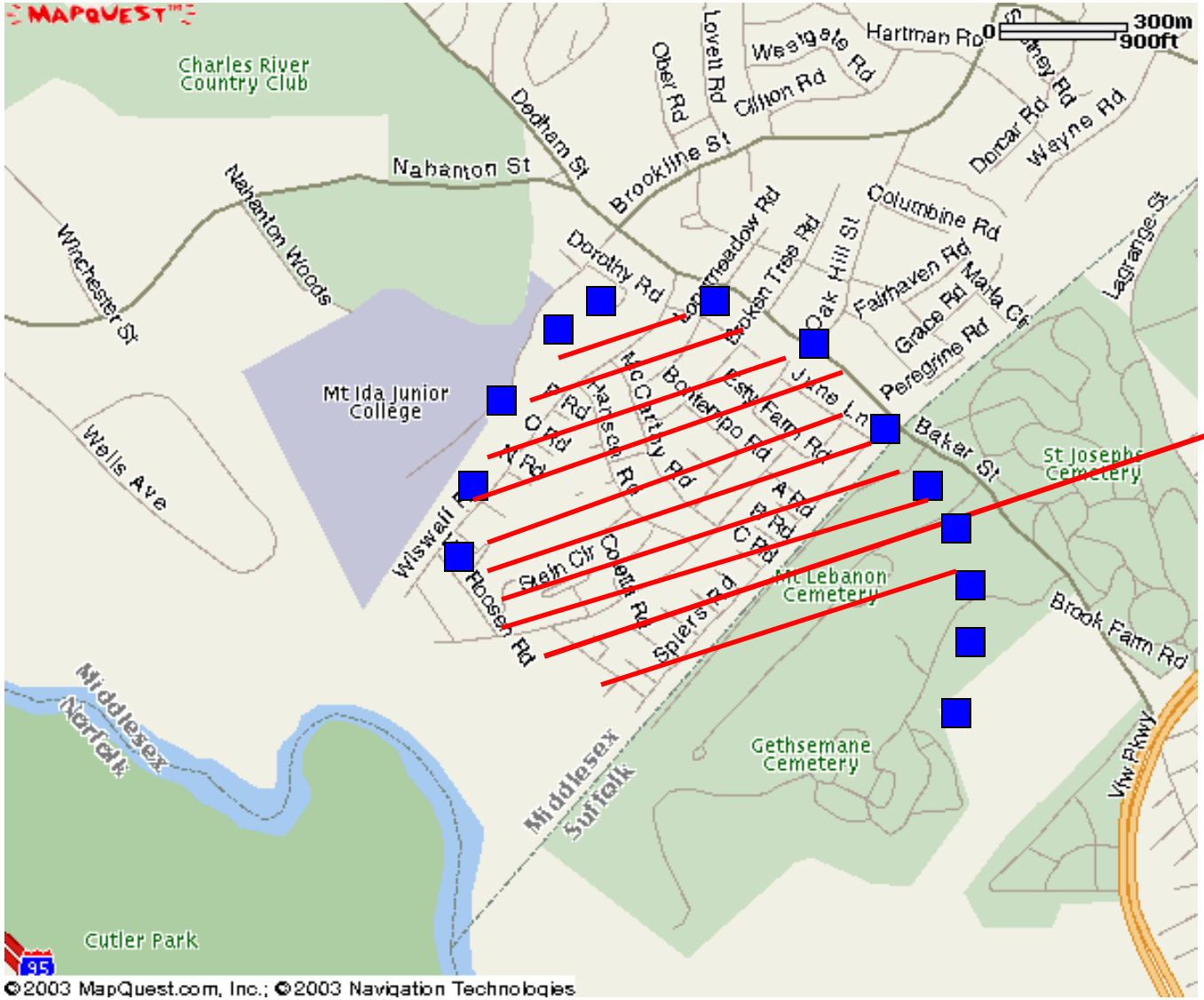


5 kW, 2 Towers (today)



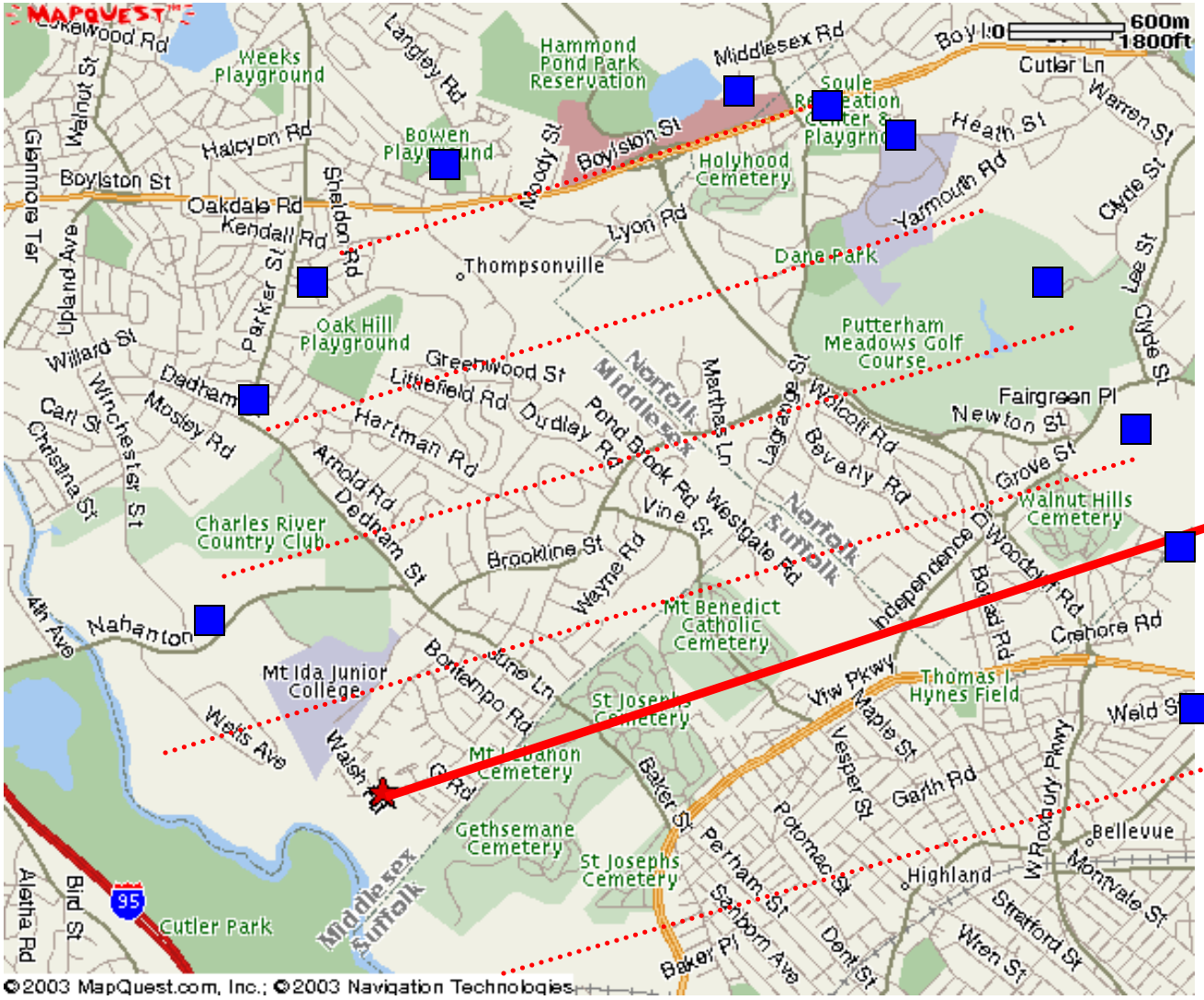
20 kW, 5 Towers (Planned)

Very Severe Interference Zone: 3 Stations



- **Power Density Exceeds 20 μW/cm²!!**

Major Interference Zone: 3 Stations



- **Power Density Exceeds 1 μW/cm²**
- **Extends to Rte. 9 and to Parker St.**

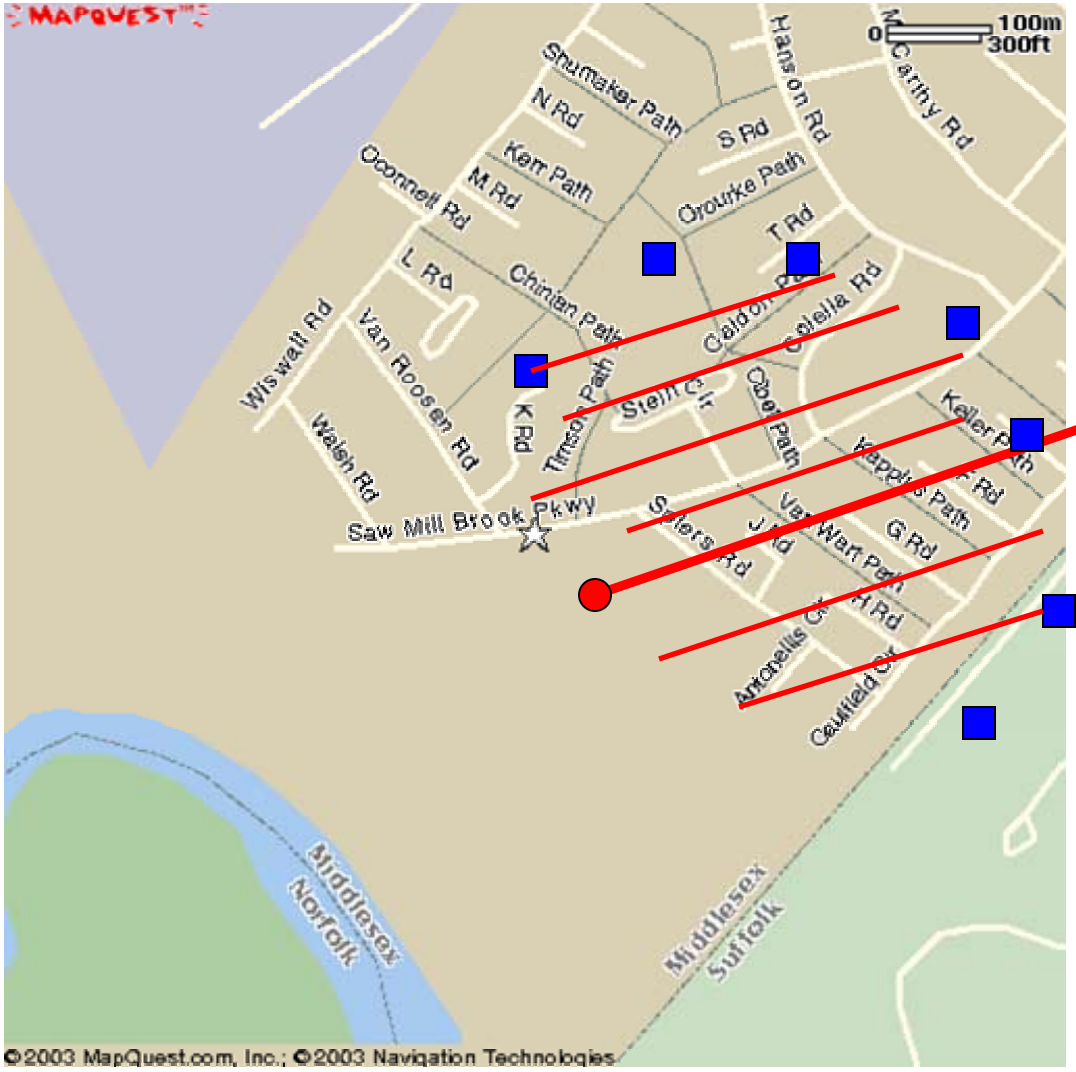
Conclusions: 3 Stations

Intensity:	Result:	Homes (5 kW, Now)	Homes (150 kW)
20 $\mu W/cm^2$ or above	Severe Interference Radiators Speak!	15	400
1 to 10 $\mu W/cm^2$	Major Interference Professional help probably required!	400	Thousands in Newton alone
0.5 to 1 $\mu W/cm^2$	Significant Interference	200 + Mt. Ida	Many, plus Brookline & West Rox.

Special Hazard: Wheelchair Safety

- One OHP Resident who uses an electric wheelchair has expressed concern about the wheelchair's sensitivity to ElectroMagnetic Interference (EMI).
- The wheelchair is a Quickie chair, Model P222.
- Per the manual, **EMI must be kept below 20 V/m**
    - Equivalent to 100 $\mu W/cm^2$
- From the Wheelchair manual, EMI above 20 V/m, " can cause your chair, without warning, to:
    - Release its brakes
    - Move by itself
    - Move in unintended directions"
- **This is a major cause for concern.**

Hazard Zone for Wheelchair



- **Based on 20 V/m limit.**
  - **100 μW/cm²**
- **Safety zone should be established by measurement.**

Can the interference be fixed?

- Assume that 4,000 homes need interference repairs requiring one person day per home.
    - Can you fix it? I was unable to completely repair the telephones and stereo in my home.
- At 200 work days per year, it will require 20 person years of effort.
    - Total cost at $100,000 per person year is $2,000,000.
- What happens when people purchase new telephones, televisions, etc? Will the repair people return? What happens when people sell their homes?
- What happens to the person with a $20,000 home entertainment system? Can it be fixed? Possibly not; what will be done?

International Safety Standards

- The Massachusetts safety limit for radiowaves is 20 mW/cm^2

- The Russian safety limit for radiowaves is 60 $\mu W/cm^2$
  - This is 333 times less than Mass. limit.

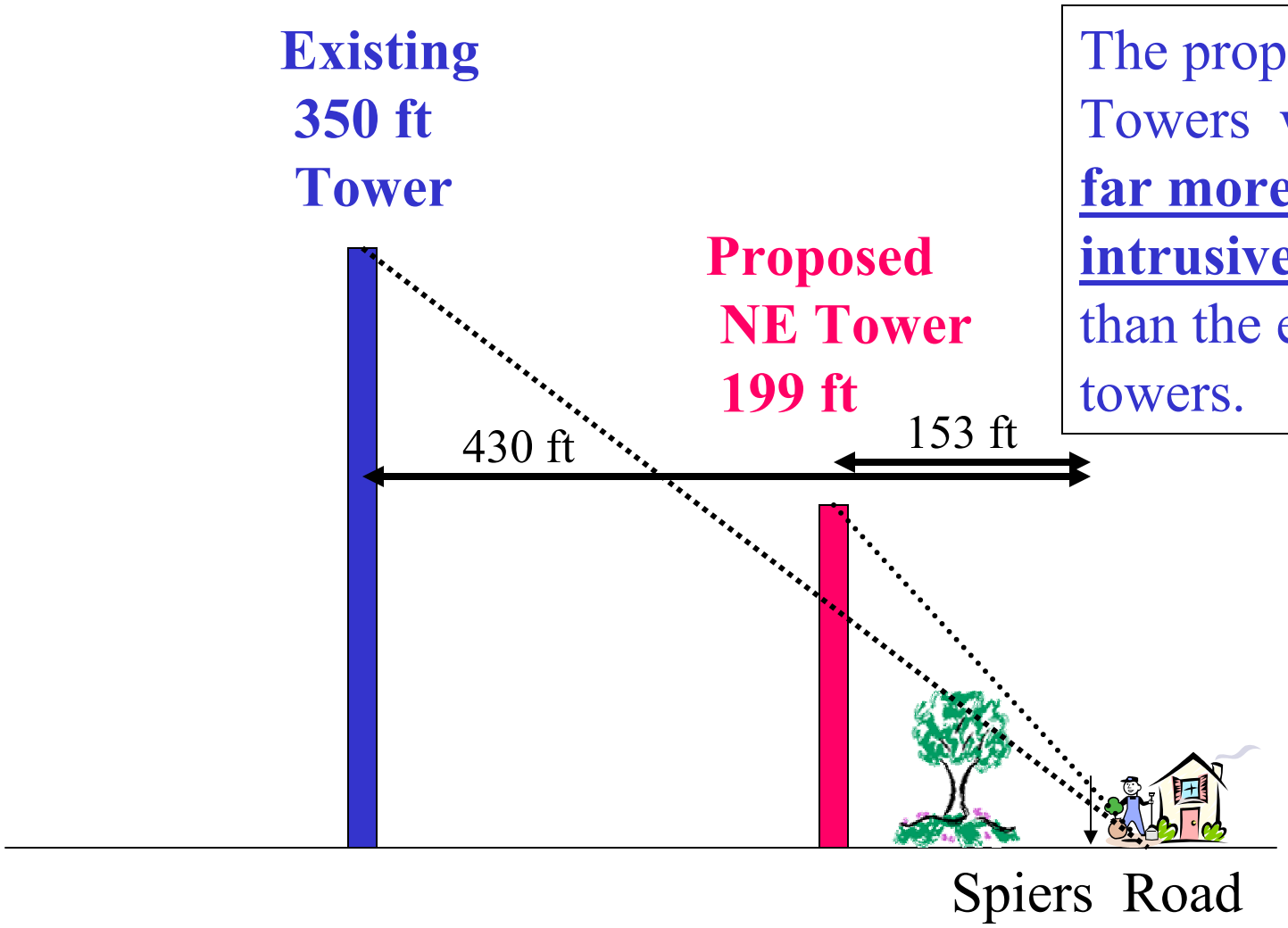
- The radiation levels in Oak Hill Park will exceed 500 $\mu W/cm^2$

- **The proposed antenna array would be illegal in Russia!!**

Summary

- **Proposed increase in broadcast power will devastate Oak Hill Park community.**
- **Interference effects will be felt in entire South Newton area.**
- **Special attention must be paid to hazards to the disabled.**
- **AM Radio Station should not be sited in a residential neighborhood.**
- **Newton Board of Aldermen should defeat this petition by a 24 to 0 vote.**

Visual Pollution



The proposed Towers will be **far more intrusive** than the existing towers.

(Note: person and house not to scale)